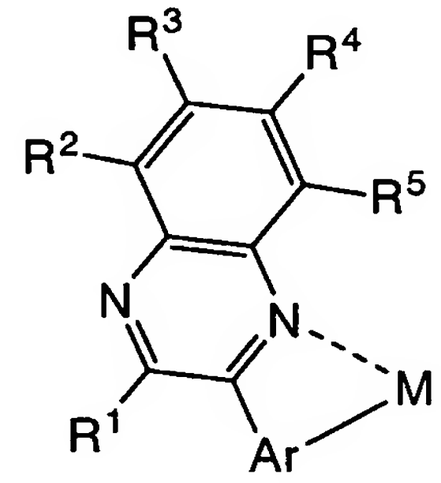
CLAIMS

1. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (1) and a compound that has a larger energy gap than the organometallic complex, and

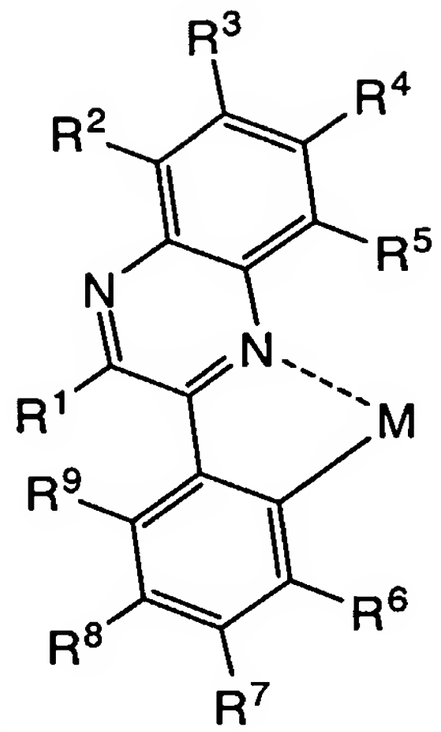


(1)

wherein each of $\mathbf{R^1}$ to $\mathbf{R^5}$ is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **Ar** is one of an aryl group having an electron-withdrawing group and a heterocyclic group having an electron-withdrawing group, and **M** is one of an element of Group 9 and an element of Group 10.

2. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (2) and a compound that has a larger energy gap than the organometallic complex, and

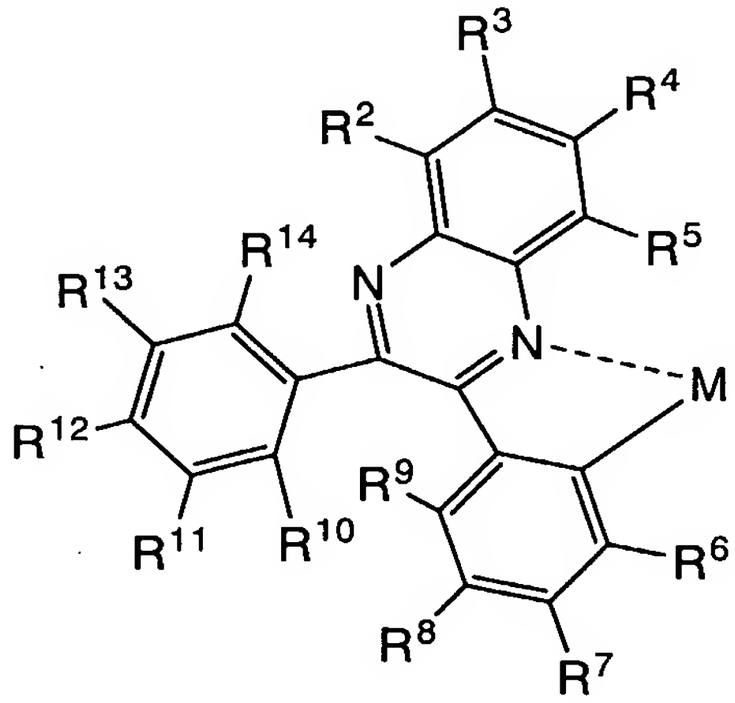


(2)

wherein each of **R**[1] to **R**[9] is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, at least one of **R**[6] to **R**[9] is an electron-withdrawing group, and **M** is one of an element of Group 9 and an element of Group 10.

3. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (3) and a compound that has a larger energy gap than the organometallic complex, and



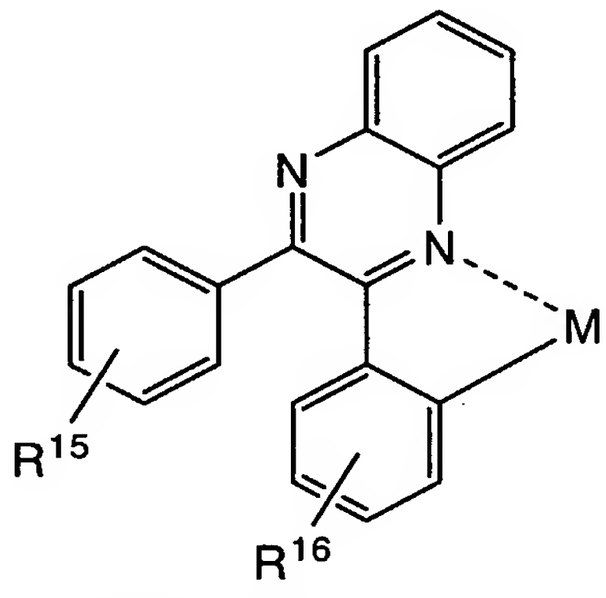
(3)

wherein each of **R**[2] to **R**[14] is selected from the group consisting of hydrogen, a

halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, and **M** is one of an element of Group 9 and an element of Group 10.

4. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (4) and a compound that has a larger energy gap than the organometallic complex, and

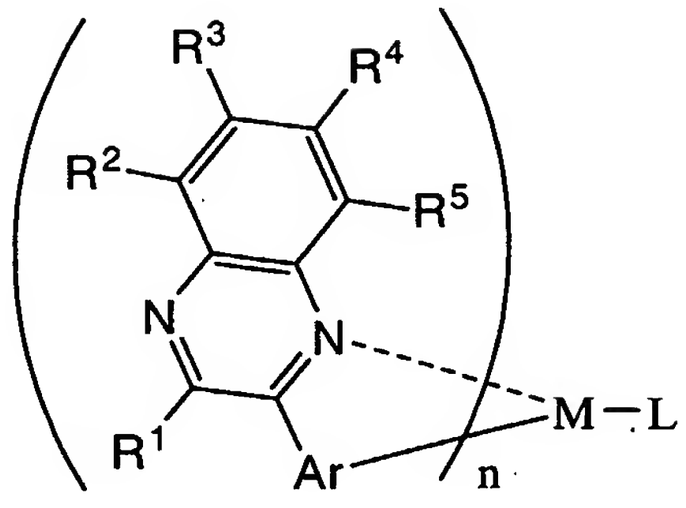


(4)

wherein each of $\mathbf{R^{15}}$ and $\mathbf{R^{16}}$ is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, and **M** is one of an element of Group 9 and an element of Group 10.

5. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (5) and a compound that has a larger energy gap than the organometallic complex, and

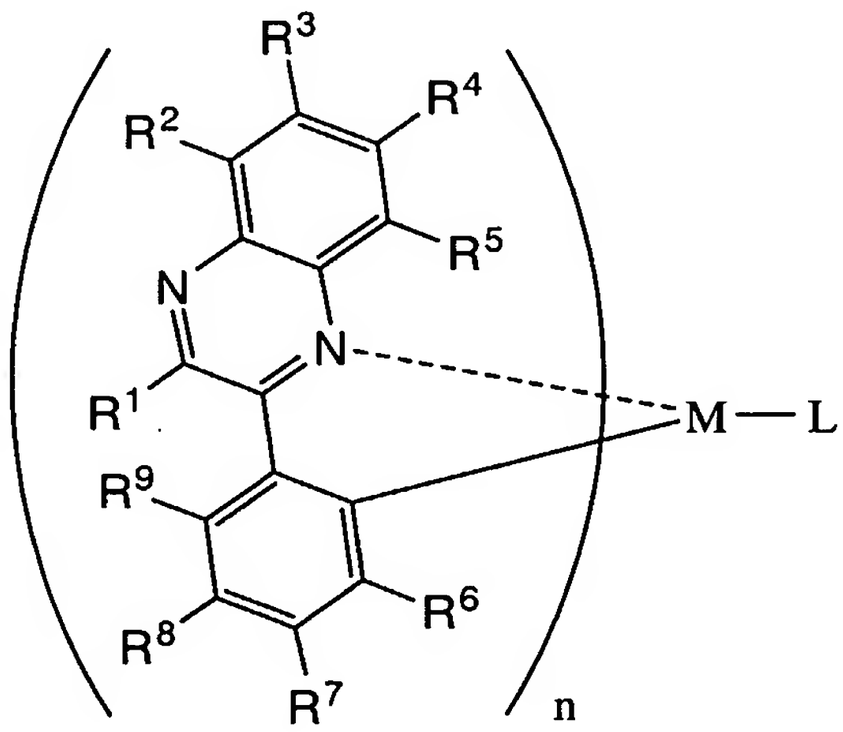


(5)

wherein each of **R**^{1} to **R**^{5} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **Ar** is one of an aryl group having an electron-withdrawing group and a heterocyclic group having an electron-withdrawing group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

6. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (6) and a compound that has a larger energy gap than the organometallic complex, and



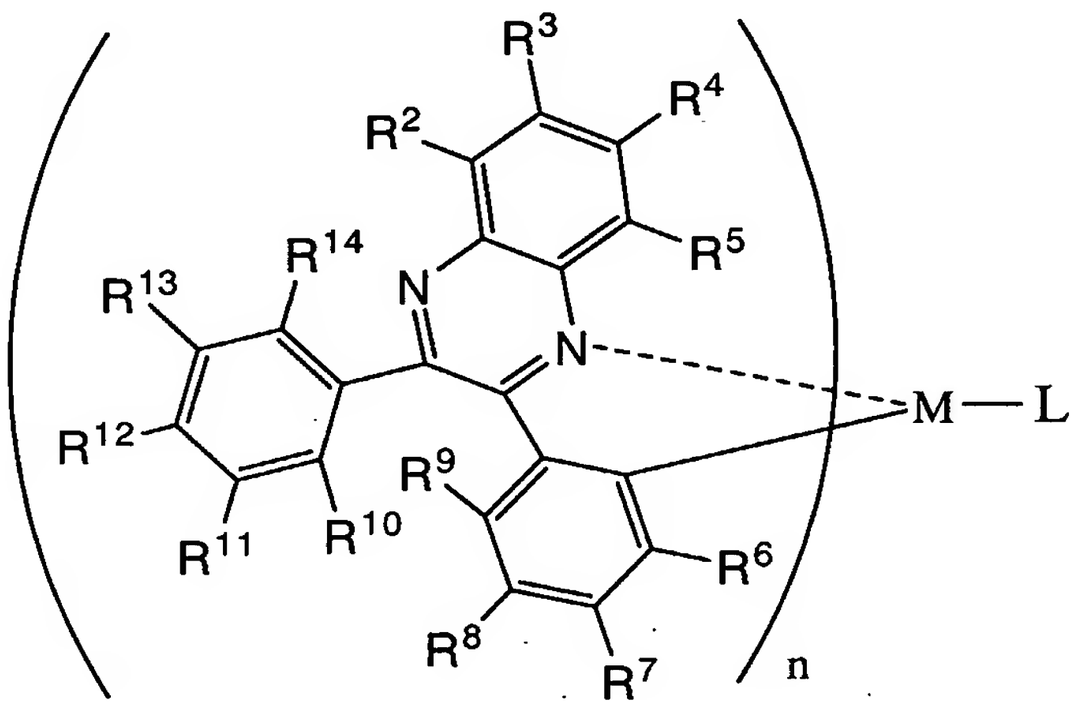
(6)

wherein each of **R**^{1} to **R**^{9} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a

cyano group, and a heterocyclic group, at least one of $\mathbf{R^6}$ to $\mathbf{R^9}$ is an electron-withdrawing group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

7. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (7) and a compound that has a larger energy gap than the organometallic complex, and

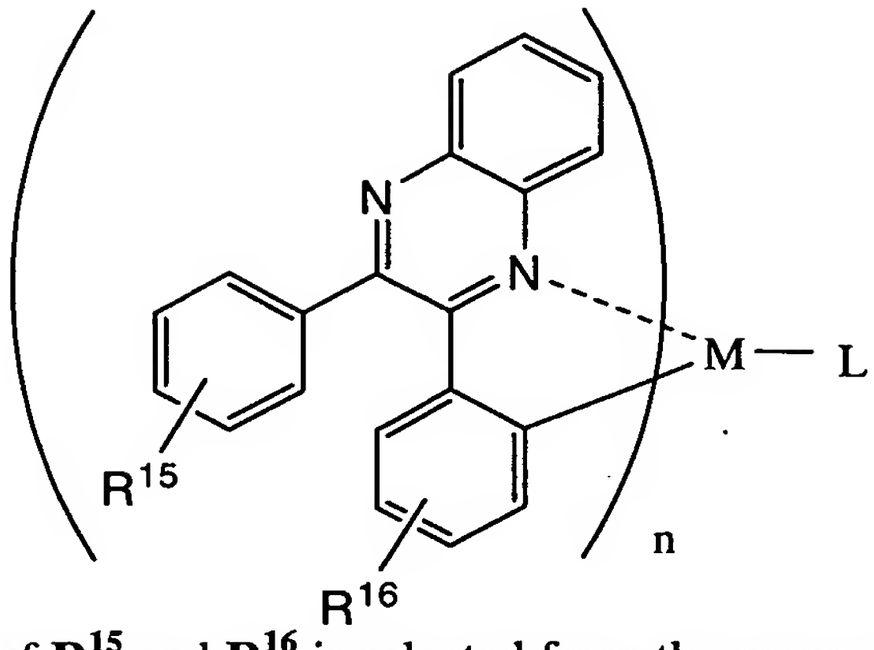


(7)

wherein each of $\mathbf{R^2}$ to $\mathbf{R^{14}}$ is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

8. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (8) and a compound that has a larger energy gap than the organometallic complex, and



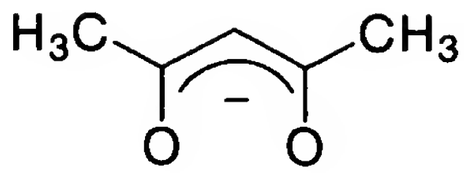
(8)

wherein each of R^{15} and R^{16} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

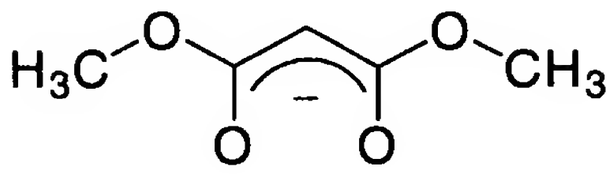
9. The light-emitting element according to any one of claims 1 to 8, wherein the compound that has the larger energy gap than the organometallic complex is one of 4, 4' - bis [N - (1 - naphthyl) - N - phenylamino] - biphenyl and tris (8 - quinolinolato) aluminum.

10. The light-emitting element according to any one of claims 5 to 8, wherein the anionic ligand **L** is one of an anionic ligand having a β-diketone structure, an anionic bidentate ligand having a carboxyl group, and an anionic bidentate ligand having a phenolic hydroxyl group.

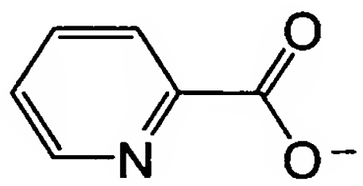
11. The light-emitting element according to any one of claims 5 to 8, wherein the anionic ligand **L** is a ligand represented by any one of the following formulas (9) to (15).



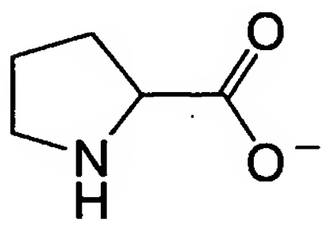
(9)



(10)



(11)



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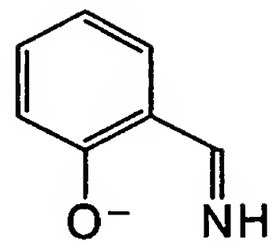
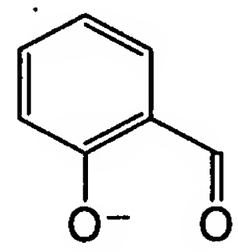
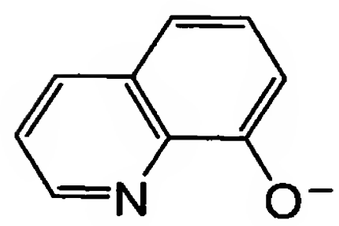


(13)



(14)



(15)

12. The light-emitting element according to any one of claims 1 to 8, wherein the light-emitting layer includes the organometallic complex and one of a first compound that has a larger energy gap than the organometallic complex and has an electron mobility of 10^{-6} cm^2/Vs or more and a second compound that has a larger energy gap than the organometallic complex and has a hole mobility of 10^{-6} cm^2/Vs or more.

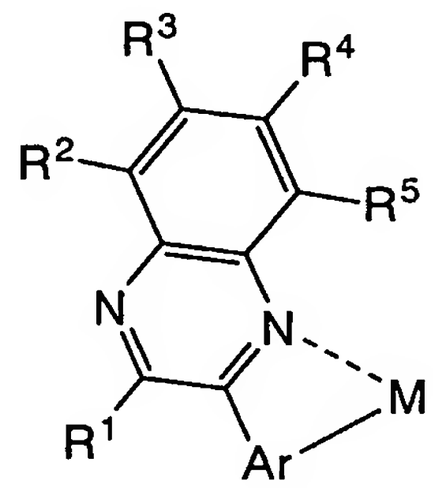
13. The light-emitting element according to any one of claims 1 to 8, wherein the light-emitting layer includes the organometallic complex, a first compound that has a larger energy gap than the organometallic complex and has an electron mobility of 10^{-6} cm^2/Vs or more, and a second compound that has a larger energy gap than the organometallic complex and has a hole mobility of 10^{-6} cm^2/Vs or more.

14. The light-emitting element according to claim 12, wherein the first compound is a metal complex, and the second compound is an aromatic amine compound.

15. The light-emitting element according to claim 13, wherein the first compound is a metal complex, and the second compound is an aromatic amine compound.

16. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (1) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

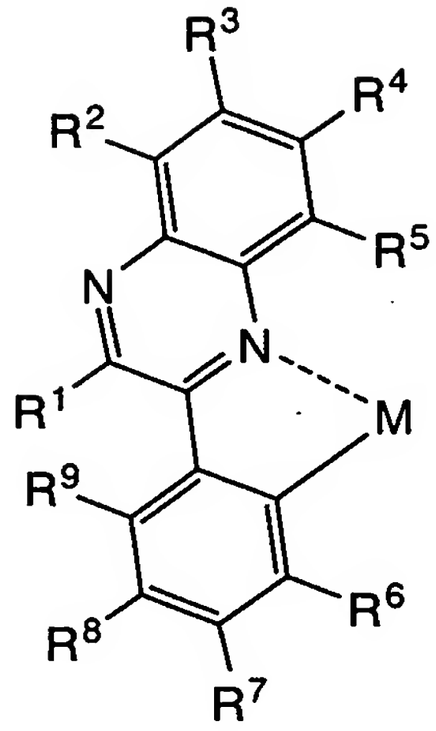


(1)

wherein each of $\mathbf{R^1}$ to $\mathbf{R^5}$ is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **Ar** is one of an aryl group having an electron-withdrawing group and a heterocyclic group having an electron-withdrawing group, and **M** is one of an element of Group 9 and an element of Group 10.

17. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (2) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

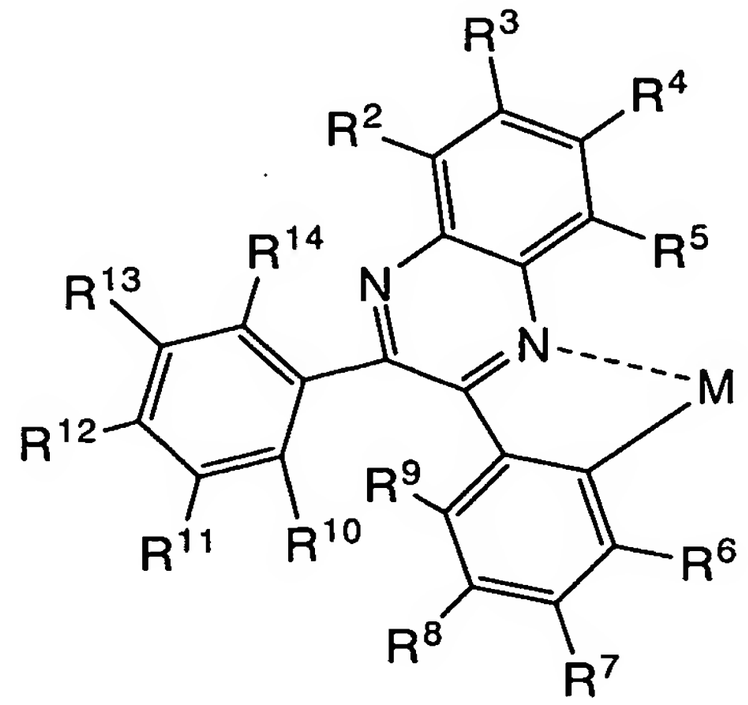


(2)

wherein each of R^1 to R^9 is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, and **M** is one of an element of Group 9 and an element of Group 10.

18. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (3) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

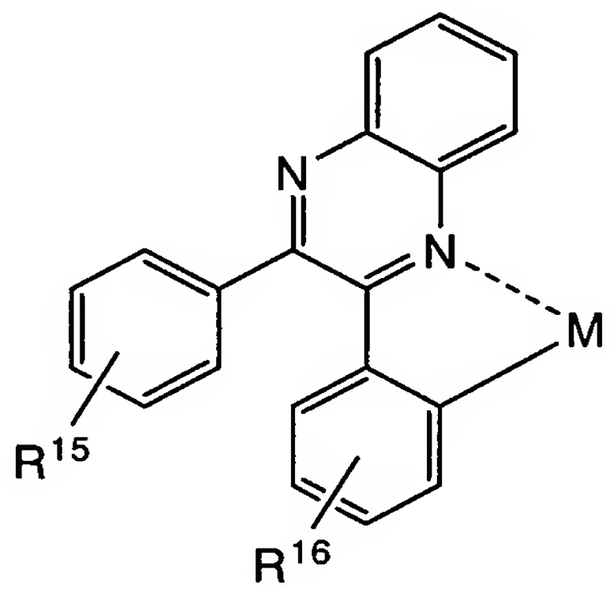


(3)

wherein each of R^2 to R^{14} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, and **M** is one of an element of Group 9 and an element of Group 10.

19. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex having a structure represented by the following general formula (4) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

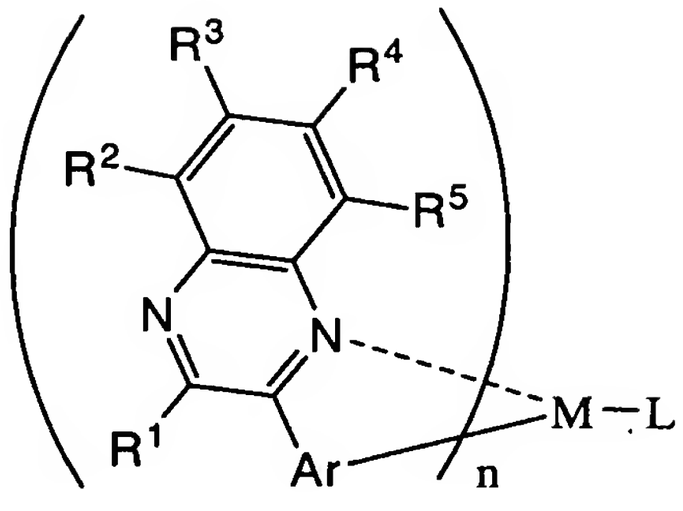


(4)

wherein each of R^{15} and R^{16} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, and **M** is one of an element of Group 9 and an element of Group 10.

20. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (5) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

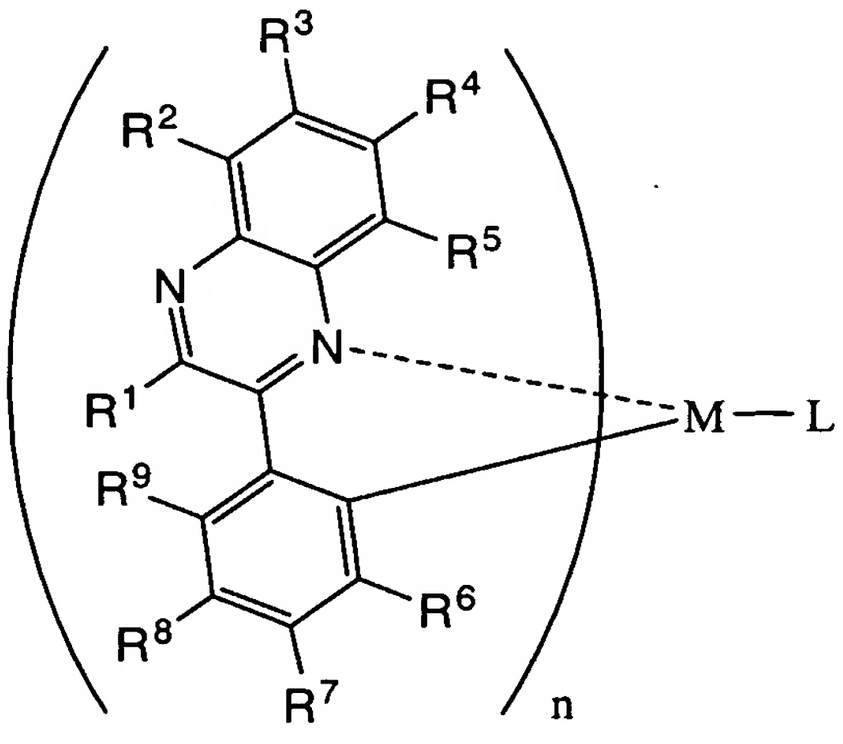


(5)

wherein each of **R**[1] to **R**[5] is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **Ar** is one of an aryl group having an electron-withdrawing group and a heterocyclic group having an electron-withdrawing group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

21. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (6) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and



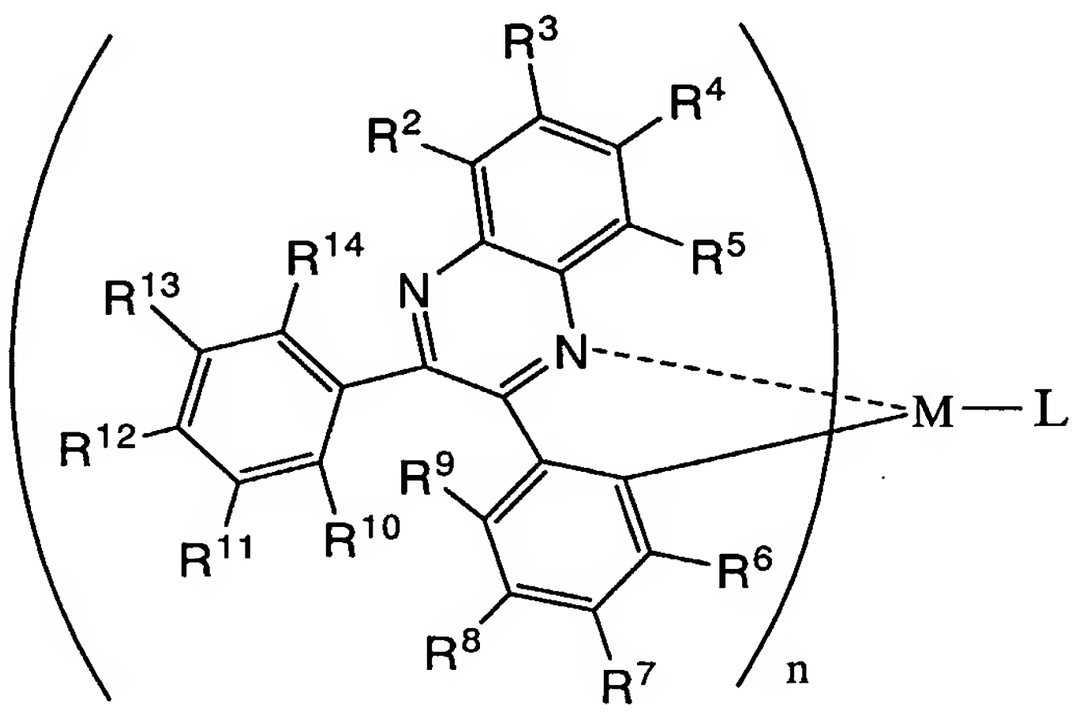
(6)

wherein each of **R**[1] to **R**[9] is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a

cyano group, and a heterocyclic group, at least one of $\mathbf{R^6}$ to $\mathbf{R^9}$ is an electron-withdrawing group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

22. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (7) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and



(7)

wherein each of $\mathbf{R^2}$ to $\mathbf{R^{14}}$ is selected form the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

23. A light-emitting element comprising a light-emitting layer between a pair of electrodes,

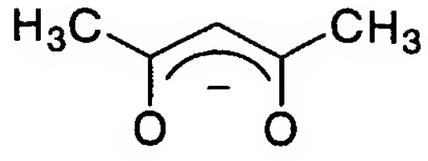
wherein the light-emitting layer comprises an organometallic complex represented by the following general formula (8) and a compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex, and

(8)

wherein each of R^{15} and R^{16} is selected from the group consisting of hydrogen, a halogen element, an acyl group, an alkyl group, an alkoxyl group, an aryl group, a cyano group, and a heterocyclic group, **M** is one of an element of Group 9 and an element of Group 10, **n** = 2 when the **M** is the element of Group 9 while **n** = 1 when the **M** is the element of Group 10, and **L** is an anionic ligand.

24. The light-emitting element according to any one of claims 20 to 23, wherein the anionic ligand **L** is one of an anionic ligand having a β-diketone structure, an anionic bidentate ligand having a carboxyl group, and a monoanionic bidentate ligand having a phenolic hydroxyl group.

25. The light-emitting element according to any one of claims 20 to 23, wherein the anionic ligand **L** is a ligand represented by any one of the following formulas (9) to (15).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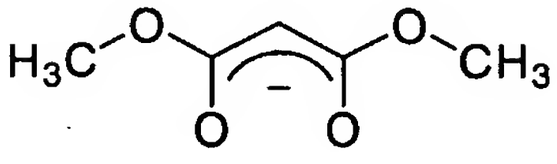
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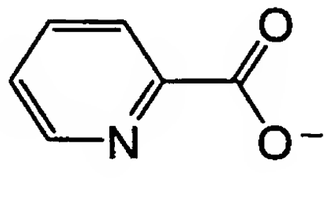
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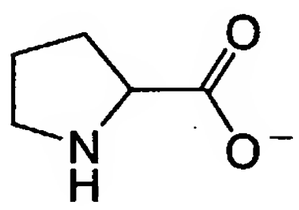
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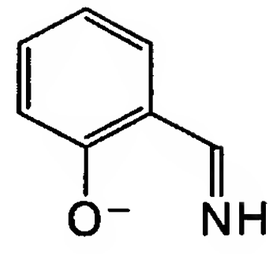
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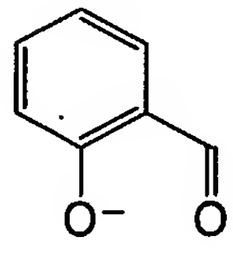
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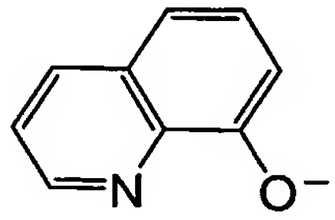
(15)

26. The light-emitting element according to any one of claims 16 to 23, wherein the light-emitting layer includes the organometallic complex and one of a first compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex and has an electron mobility of 10^{-6} cm^2/Vs or more and a second compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex and has a hole mobility of 10^{-6} cm^2/Vs or more.

27. The light-emitting element according to any one of claims 16 to 23, wherein the light-emitting layer includes the organometallic complex, a first compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex and has an electron mobility of 10^{-6} cm^2/Vs or more, and a second compound that has a larger ionization potential and a smaller electron affinity than the organometallic complex and has a hole mobility of 10^{-6} cm^2/Vs or more.

28. The light-emitting element according to claim 26, wherein the first compound is a metal complex, and the second compound is an aromatic amine compound.

29. The light-emitting element according to claim 27, wherein the first

compound is a metal complex, and the second compound is an aromatic amine compound.

30. The light-emitting element according to any one of claims 1 to 8, further comprising at least one of a hole injecting layer, a hole transporting layer, a hole blocking layer, an electron transporting layer, and an electron injecting layer.

31. The light-emitting element according to any one of claims 16 to 23, further comprising at least one of a hole injecting layer, a hole transporting layer, a hole blocking layer, an electron transporting layer, and an electron injecting layer.

32. A light-emitting device using the light-emitting element according to any one of claims 1 to 8.

33. A light-emitting device using the light-emitting element according to any one of claims 16 to 23.